A NEW SPECIES OF *LYTHRYPNUS* (PISCES: GOBIIDAE) FROM THE TROPICAL WESTERN ATLANTIC

Jaime Garzón and Arturo Acero P.

ABSTRACT

A new species of fish of the family Gobiidae, *Lythrypnus minimus*, is described based on material collected in coralline areas of the Colombian Caribbean. The species had been collected previously in the Bahamas, but confused with *L. elasson*. It is distinguished from its congeners from the Atlantic principally by its tiny size, low scale counts, and pigmentation. Marked sexual dimorphism in coloration and length of the dorsal filament, as well as wide variability in pigmentation, make identification difficult. *L. minimus* is the smallest species of the genus and one of the smallest vertebrates known. The archipelagos of Rosario and San Bernardo are the only places where important populations of the species are known.

The genus *Lythrypnus* Jordan and Evermann is one of the more diversified of the fish family Gobiidae in coral reefs of the western Atlantic. Because of the small size and cryptic habits of the species it is also one of the least known. Böhlke and Robins (1960), studying material from the Greater Antilles and northern regions, recognized seven species from the western Atlantic, describing four of them as new. Later these authors described another species from the Bahamas (Robins and Böhlke, 1964).

Recent collections on the South American coast have revealed the existence of other undescribed species of *Lythrypnus*. D. W. Greenfield (University of Colorado, Denver, U.S.A., pers. comm.) is preparing a revision of the *L. mowbrayi* complex, including a new species from Brasil. A study of the fauna of Colombian Caribbean reef gobies produced abundant material of seven species of the genus (Garzón, 1987). One of them, a new species, is here described as *L. minimus*.

Specimens were collected diving with SCUBA and using small quantities of rotenone solution. Figure 1 shows the localities of the five areas of the Colombian Caribbean where the material of the new species was found. Isla de Providencia is located east of Nicaragua, but it is part of the Colombian island territories.

METHODS

Methods of measuring and counting basically follow those of Böhlke and Robins (1968). Measurements were taken with an ocular micrometer. Predorsal, preanal and prepelvic lengths were measured from snout tip to anterior origin of the fins. The first element of the second dorsal and anal fins is included with the segmented rays of these fins in the counts. Some specimens were cleared and stained with alizarine red in order to count vertebrae, radials, ribs and gill rakers.

Materials were fixed with formalin, kept in ethanol and deposited in the fish collections of the following institutions: Instituto de Investigaciones Marinas de Punta de Betín, Santa Marta, Colombia (INVEMAR-P); Rosenstiel School of Marine and Atmospheric Science, University of Miami (UMML); Museo de Historia Natural, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia (ICNMNH); Florida State Museum, University of Florida, Gainesville, U.S.A. (UF). One specimen from the Bahamas, deposited at the Academy of Natural Sciences of Philadelphia, U.S.A. (ANSP) was also studied. In the material examined section the number of specimens followed by their size range in millimeters appears in parentheses after the catalogue number. Unless it is otherwise stated, all sizes are standard lengths.

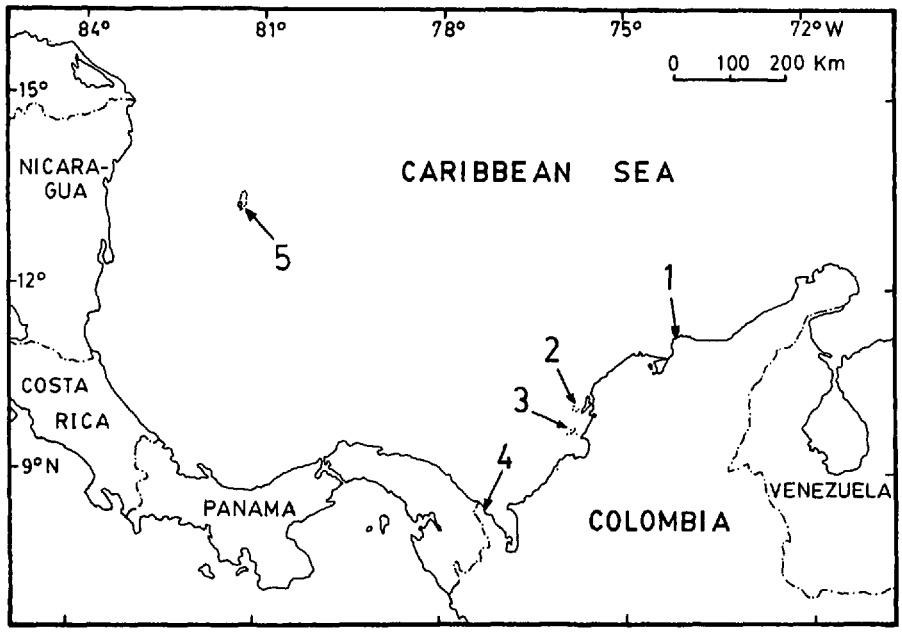

Figure 1. Collection areas of *Lythrypnus minimus* in the Colombian Caribbean: Santa Marta (1), Islas del Rosario (2), Islas de San Bernardo (3), Urabá (4), and Isla de Providencia (5).

Lythrypnus minimus new species
Figure 2

Lythrypnus elasson Böhlke and Robins 1960: 78 (in part, text figure 1); Böhlke and Chaplin (1968): 625 (in part, photograph).

Diagnosis.—The smallest species of the genus, reaching to a maximum size of 11 mm; genital papillae sexually dimorphic from about 7 mm. Twenty-four lateral rows of scales. Scaleless patch below first dorsal fin extending behind the base of the last spine. First two dorsal spines prolonged as filaments in adult males. Body usually with alternating, well contrasted, pale and dark vertical bars, except in adult females, which may be uniformly pigmented. Pale bars narrower and rarely include defined central dark lines. Pectoral-fin bases in adult males with a prominent dark spot, which covers the entire vertical extent. Cheek with bars or vertical rows of dark spots, such marks diffuse in juveniles and absent in mature females.

Description.—The genus *Lythrypnus,* like many groups of gobies, is very homogeneous in morphology and species distinction is based largely on characteristics of pigmentation. *Lythrypnus minimus* is not exceptional in this regard and its morphology agrees well with the 24 characters used by Böhlke and Robins (1960) to define the tropical western Atlantic species of the genus, except that these authors interpreted the vertebral counts as 9 + 17 = 26 instead of 10 + 16. Therefore several characteristics already described are not presented here and emphasis is placed on pigmentation.

Frequency distributions of fin-ray counts and measurements of body parts are given in Table 1. The meristic formulae of *L. minimus* are: D VI, 9 or 10 (usually 10, abnormally 7 or 11); A 8 or 9 (usually 9); P_1 14–16 (modally 15, abnormally

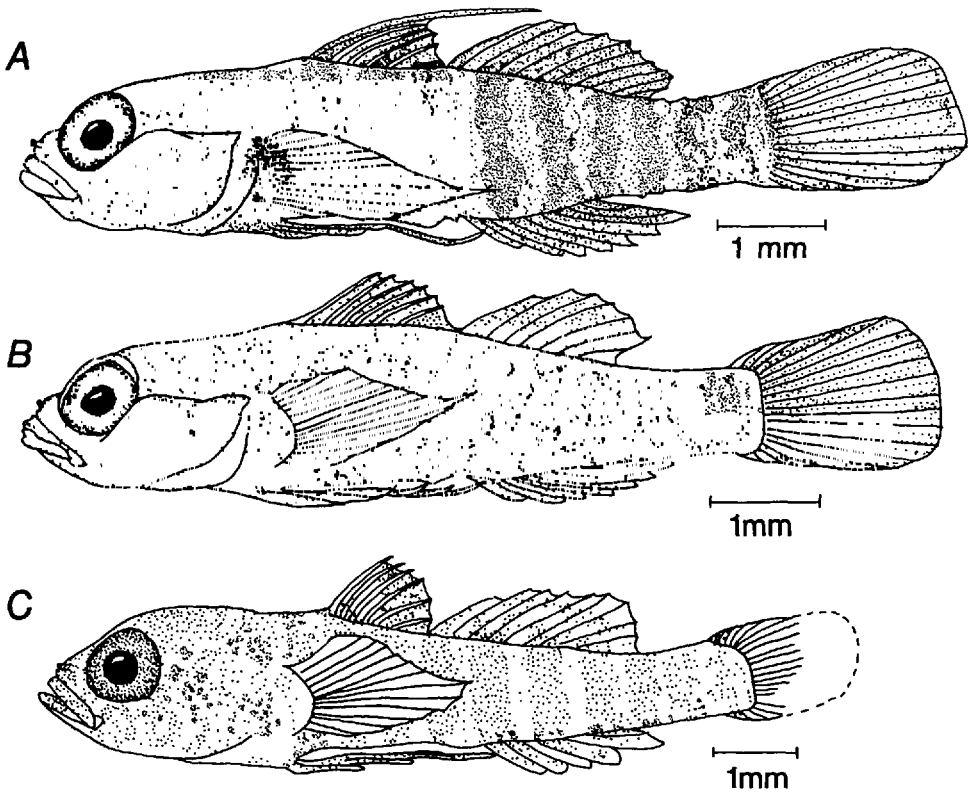

Figure 2. Pigmentation patterns of *Lythrypnus minimus*. A. Paratype, adult male, 8.9-mm SL, UMML; B. Paratype, mature female, 8.7-mm SL, UMML; C. Paratype, juvenile, 6.0-mm SL, UMML. Illustrated by S. Kelley.

12 or 13); lateral scale rows 24 in 34 specimens (scalation incomplete in juveniles). 17 segmented and 11 branched caudal-fin rays in 12 specimens. Six cleared and stained specimens with 10 precaudal and 16 caudal vertebrae, 4 pectoral radials and 7 pairs of pleural ribs. One with 16 pairs of epipleural ribs and 6 rudimentary gill rakers on first arch.

Belly scaled; body dorsum scaleless adjacent to first dorsal fin to point varying from just behind sixth spine base to origin of soft dorsal. Dorsal spine one and two prolonged on adult males, on some large females slightly so, reaching base of last dorsal ray on largest male; spine one longer than spine two. Pectoral, dorsal and anal-fin rays unbranched. Pelvic fin rays branched. Pelvic and pectoral fins long, surpassing origin of anal fin, but not reaching middle of its base. Posterior margin of caudal fin straight to slightly oblique, its posterior extreme rarely surpassing the anterior margin of pupil. Tongue bluntly pointed anteriorly.

Coloration.—The pigmentation in preservative of *L. minimus* is highly variable. Figure 2 illustrates two extreme cases, the patterns of an adult male and a mature female; the color pattern of a juvenile is also shown. In general, the coloration in alcohol preserved specimens is pale to dark brown; snout region and inferior half of head paler; body with alternate pale and dark bars that are usually well contrasted except in adult females which may be uniformly pigmented; pale bars notably narrower than dark ones and contain sparse melanophores that are rarely

Table 1. Summary of meristic and morphometric data for *Lythrypnus minimus*. For meristic data, the number within parentheses after each count indicates the number of specimens. Ranges and averages (the latter in parentheses) of measurements are expressed as percentages of standard length

	Holotype	Type series	ANSP 92885
Meristic characters:			
Dorsal fin rays	VI-10	VI-7(1), 9(5), 10(43), 11(1)	VI-10
Anal fin rays	9	8(3), 9(46)	9
Pectoral fin rays (both fins)	15	12(1), 13(1), 14(8), 15(72), 16(18)	15
Morphometric characters:		N = 16	
Standard length	9.8 mm	6.7–10.9 mm	9.4 mm
Upper jaw length	9.2	9.2–11.8 (10.3)	10.6
Head length	31.6	31.3–34.3 (32.1)	30.9
Snout length	6.1	5.5–7.1 (6.4)	6.4
Pectoral fin length	31.6	31.2–36.3 (33.1)*	–
Pelvic fin length	28.6	28.6–34.0 (31.4)	34.0
Body depth	21.4	21.4–24.5 (23.2)	23.4
Caudal peduncle depth	11.2	10.8–12.9 (11.6)	11.7
Eye diameter	10.2	9.3–11.3 (10.1)	10.6
Predorsal length	38.8	38.8–44.1 (40.9)	39.4
Preanal length	60.2	58.2–63.7 (61.7)	61.7
Prepelvic length	34.7	31.7–38.2 (34.4)	33.0

* Based on 11 specimens.

organized in dark central lines (tenuous and poorly defined when present); 10 pale bars in body behind base of pectoral fin and one or two more anteriorly on nape; cheek area with two to four dark bars or vertical rows of spots that run ventroposteriorly from the ventral margin of orbit; normally, a similar bar on posterior margin of preopercle; these head bars are usually well defined and intense in adult males, diffuse in juveniles and absent in mature females; base of pectoral fin in adult males with a dark blotch, which is intense (to black), roundish and wide, covering the entire vertical extent of base and the basal portion of pectoral rays; in young of both sexes and adult females this blotch is reduced or absent. All fins are sprinkled with melanophores, especially the dorsal, anal and pelvic fins of males; basal portion of dorsal fin brown; contracted and packed melanophores may form some small black spots on dorsal (both) and caudal fins; iris silvery with abundant melanophores.

In general, adult males are darker with the bar pattern more contrasted and the basipectoral blotch more developed and intense than in females. Some females are so uniformly pigmented that they do not have any evidence of pale bars, or marks on the face or on pectoral-fin base as it is shown in Figure 2. Variation within the same sample is sometimes so great that it is possible to find a vast array of intermediate patterns, such as females with a well contrasted pattern of body bars and a conspicuous basipectoral blotch, or dark adult males, lacking pale bars or conspicuous face marks. Variability involves intensity of pigmentation, width and discreetness of pale bars, size and intensity of basipectoral blotch; number, size and placement of melanophores within pale bars; and form, number and intensity of the dark bars on the head. The smallest juveniles (less than 6 mm) have a pale blotch on first dorsal fin (Fig. 2) and in one juvenile specimen pale bars are much wider than dark bars.

Life colors were not observed. However, just fixed individuals had red or orange pigment on head, body and vertical fins, especially in the less pigmented females. There was silver pigment within pale bars, principally near the mid-body dorsum.

Size.—*Lythrypnus minimus* is the smallest species of the genus, probably the smallest fish in the Atlantic and one of the smallest vertebrates of the world. The largest specimen examined is a male 14.0 mm in total length and 11.0 mm in SL, the majority of specimens (about 85%) are smaller than 9.0 mm and the smallest juvenile is 5.9 mm. Robins and Böhlke (1964) inferred that *L. okapia* was the smallest fish in the western Atlantic because its holotype was only slightly larger than 1 cm in SL; this species is very rare and only males are known: Robins and Böhlke (1964) used two males for describing it and Garzón (1987) found another male (10.9 mm) in the Colombian Caribbean. In any case, the smallest ripe females of *L. minimus* were found from 7.5 mm, which is more than 1 mm smaller than the smallest specimen of *L. okapia*; the absence of females of *L. okapia* in the collections precludes adequate comparisons between these species. Nelson (1984) informed that the smallest known vertebrate is the gobiid *Trimmaton nanus* Winterbottom and Emery, recently described from the Indian Ocean; the females of that species reach maturity from 8 mm.

Sexuality.—Sexual dimorphism in pigmentation and length of the first two dorsal-fin spines is marked as previously described. Also, the genital papilla is elongated and pointed in males, shorter, truncate and broad in females. It is possible to distinguish the sex from genital papillae in specimens from around 7 mm.

Sexually mature females between 7.5 and 10 mm were found in February and March in Islas del Rosario and in October at Islas de San Bernardo. An 8.4 mm female had 22 round eggs in the left ovary and 10 in right; eggs varied in diameter between 0.5 and 0.6 mm and there were also some much smaller granules.

Habits.—*Lythrypnus minimus* is an inhabitant of living coral reefs. Only on one occasion was it collected in an environment of boulders scarcely covered by corals. It was found from 1-m depth in low relief reefs dominated by the coral *Porites porites* to 20-m depth at the lower limit of reef formations. The habitats included isolated coral heads and patch reefs in protected lagoon areas and compact reefs. The largest collections (25–75 individuals per sample) were obtained between 4- and 9-m depth. Like other species of the genus, *L. minimus* has not been observed alive and its microhabitat is unknown. It probably inhabits dead portions of corals and reef interstices and caves, as suggested by its occurrence at collection stations. In the Colombian Caribbean it was collected together with *L. crocodilus, L. elasson, L. heterochroma, L. nesiotes, L. okapia* and *L. spilus,* but principally with the last species. The digestive tracts of two specimens 7.2 and 8.4 mm contained microcrustaceans (many copepods and one tanaidacean).

Comparisons.—Of the eight species of the genus previously known from the western Atlantic, *L. minimus* is most similar to *L. spilus, L. heterochroma* and *L. elasson* in having prolonged spines in dorsal fin. *Lythrypnus minimus* and *L. heterochroma* have fewer than 25 transverse rows of scales, but their pigmentation patterns are clearly distinct. *Lythrypnus minimus* and *L. spilus* are more similar in coloration and are frequently difficult to separate with the naked eye, but *L. spilus* is a much larger species (reaching to 21.3 mm and growing frequently over 16 mm) with the scaleless patch under the spinous dorsal-fin not extending beyond the middle of the fin and with 25–27 (usually 26) transverse rows of scales. Moreover, in *L. spilus* the narrow bars usually contain central dark lines, at least in the predorsal region, and the genital papillae are sexually distinct only from about 11-mm SL. Those individuals of *L. minimus* with less developed pattern of bars and basipectoral blotch, especially the adult females that sometimes are uniformly pigmented, may also be confused with *L. elasson*; however, *L. elasson*

frequently grows over 12-mm SL, has 25 or 26 transverse rows of scales and never shows dark marks on cheek and pectoral base or evidence of pale and dark bars on body sides.

The apparent rarity of *L. minimus* in the Atlantic, its dwarf size and wide variation in pigmentation probably inhibited its recognition, which is now possible because of the abundant Colombian material. Böhlke and Robins (1960) and Böhlke and Chaplin (1968), for example, confused one specimen of *L. minimus* collected in the Bahamas (ANSP 92885) with *L. elasson,* saying that it must be an occasional variant with bars on the body. That northern specimen was examined after more than 25 years in alcohol, but the published photograph of pigmentation is typical of *L. minimus.* As shown in Table 1 there are almost no meristic or morphometric differences between the Bahaman specimen and the Colombian type series; and therefore the specimen is considered conspecific with *L. minimus.*

Distribution.—Presently known only from the north coast of Colombia, Isla de Providencia in the western Caribbean, and the Bahama Islands. It seems to be common solely in the Colombian coastal region including the islands of Rosario and San Bernardo (Fig. 1), where it appeared in about half of the rotenone samplings (up to 75 specimens per collection). In the other Colombian regions it has been found in only one or two samples and never more than one individual per sample. It is known from the Bahamas only from one specimen collected near Green Cay (ANSP 92885). It may be more widely distributed in other Caribbean regions, but appears uncommon and perhaps has been confused with other species of the genus.

Common Name.—Since this species seems to be the smallest Atlantic member of the family Gobiidae, it is properly called "pygmy goby."

Etymology.—From Latin *minimus,* meaning "the smallest," alluding to its tiny size.

Material Examined.—All the specimens, excepting that from the Bahama Islands, collected by the authors in the Colombian Caribbean regions shown in Figure 1.

Holotype.—INVEMAR-P 1185 (an adult male, 9.8-mm SL); ca. 0.5 km in front of Playa Blanca, Isla Barú, Islas del Rosario area; 8.5-m depth; 10 February 1986.

Paratypes.—Islas del Rosario area: INVEMAR-P 1183 (67, 5.9–9.8), taken with the holotype. UMML 34418 (3, 6.0–8.9) Fig. 2, taken with the holotype. INVEMAR-P 1184 (31, 6.7–10.9); patch reef in front of SW shore of Isla Tesoro; 4-m depth; 5 March 1984. INVEMAR-P 1186 (25, 5.9–9.6); ca. 0.5 km SW of Isla Periquitos; 6-m depth; 11 February 1986. UF 44559 (6, 6.6–10.9), taken with the holotype. Islas de San Bernardo area: INVEMAR-P 1187 (2, 8.2 and 8.5); ca. 1.2-km north of Isla Múcura; 4-m depth; 8 October 1982. INVEMAR-P 1185 (5, 8.2–9.9); south shore of Isla Panda; 4-m depth; 9 October 1982. ICNMNH 1072 (5); ca. 1.5 km north of Isla Tintipán; 16-m depth; 7 October 1982. UF 44557 (7, 8.8–11.0); ca. 1.3 km NW of Isla Múcura; 4-m depth; 3 October 1982. Santa Marta area: INVEMAR-P 1180 (1, 10.2); west side of Bahía de Gayraca, Parque Nacional Tayrona; 7-m depth; 2 October 1981. INVEMAR-P 1182 (1, 10.5); east side of Bahía Concha, Parque Nacional Tayrona; 12–14-m depth; 15 October 1981. Urabá area: INVEMAR-P 1189 (1, 8.6); north side of Ensenada Sapzurro, NW coast of Golfo de Urabá; 5–6-m depth; 7 February 1985. Isla de Providencia: INVEMAR-P 1190 (1, 10.1); ca. 0.1 km south of Basalt Cay; 6-m depth; 7 December 1980.

Other Material.—ANSP 92885 (1, 9.4); Green Cay, north of Rose Island, Bahamas; 14 November 1959; C. C. G. Chaplin, J. E. Böhlke, C. R. Robins and B. Parker.

ACKNOWLEDGMENTS

The Fondo Colombiano de Investigaciones Científicas y Proyectos Especiales "Francisco José de Caldas" (COLCIENCIAS) has supported the main portion of our studies on the Colombian coral reef

fishes (30003-1-24-80, 30003-1-30-81 and 30003-1-55-83). The Instituto de Investigaciones Marinas de Punta de Betín (INVEMAR) has collaborated with the required infrastructure. There several colleagues have been extremely helpful during the field work. The Centro de Investigaciones Pesqueras from INDERENA, through our colleagues F. Duque G. and J. Gallo N., cooperated during our scientific visits to Islas del Rosario. D. W. Greenfield (University of Colorado) facilitated unpublished information about his research on *Lythrypnus*. W. F. Smith-Vaniz (ANSP) lent the paratype of *L. elasson* which is a pygmy goby. S. Zea corrected the English text.

Literature Cited

Böhlke, J. E. and C. C. G. Chaplin. 1968. Fishes of the Bahamas and adjacent tropical waters. Livingston Publ. Co., Wynnewood, Pennsylvania, U.S.A. 771 pp.

——— and C. R. Robins. 1960. Western Atlantic gobioid fishes of the genus *Lythrypnus*, with notes on *Quisquilius hipoliti* and *Garmannia pallens*. Proc. Acad. Nat. Sci. Phila. 112: 73–98.

——— and ———. 1968. Western Atlantic seven-spined gobies, with descriptions of ten new species and a new genus, and comments on Pacific relatives. Proc. Acad. Nat. Sci. Phila. 120: 45–174.

Garzón, J. 1987. Los góbidos arrecifales del Caribe colombiano (Pisces: Gobiidae). I. Consideraciones generales y sistemática de los géneros *Bathygobius, Coryphopterus, Gnatholepis, Ioglossus, Lythrypnus* y *Quisquilius*. M. Sc. Thesis, Facultad de Ciencias, Universidad Nacional de Colombia, Bogotá. 224 pp.

Nelson, J. S. 1984. Fishes of the world, 2nd ed. John Wiley & Sons, New York. 523 pp.

Robins, C. R. and J. E. Böhlke. 1964. Two new Bahaman gobiid fishes of the genera *Lythrypnus* and *Garmannia*. Notulae Naturae 364: 1–6.

Date Accepted: March 30, 1988.

Addresses: *(J.G.) Instituto de Investigaciones Marinas de Punta de Betín (INVEMAR), Apartado 1016, Santa Marta, Colombia; (A.A.P.) Universidad Nacional de Colombia, INVEMAR, Santa Marta, Colombia.*